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| **Evidence Record** |
| |  |  | | --- | --- | | Penny Date | Equation of the Best-Fit Line:  *y* = *ax* + *b* | | 1963–1981 | *m*: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  *b*: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Correlation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Equation (*y* = *mx* + *b*):  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | 1982 | *m*: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  *b*: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Correlation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Equation (*y* = *mx* + *b*):  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | After 1982 | *m*: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  *b*: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Correlation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Equation (*y* = *mx* + *b*):  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | |

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| **Case Analysis** |
| **Answer the following questions.** |
| Q1. If you add 2 pennies to the cup, will the data point fall on the line? Explain. |
| Q2. The equation for a straight line is *y = mx + b*, where *x* and *y* are coordinates on the line, *m* is the slope of the line, and *b* is the *y*-intercept (the value of *y* when *x* = 0).  In this case, *y* is the weight of the pennies in Newtons and *x* is the number of pennies. What does the slope, *m*, represent? What are the units of slope in this equation? |
| Q3. What does the y-intercept, *b*, represent? |
| Q4. Was the value of *b* that you recorded for each group of pennies the same? If not, explain why not. |
| Q5. How do the “densities” (slope) of the three sets of pennies compare? Based on your measurements, what do you think probably happened to the composition of the penny in 1982? |
| Q6. Use the appropriate equation to determine the weight of 5000 pennies from 1980. Show the equation you used and how you rearranged and/or substituted into the equation. Underline your answer. |
| Q7. Use the appropriate equation to determine the weight of 5000 pennies from 2005. Show the equation you used and how you rearranged and/or substituted into the equation. Underline your answer. |
| Q8. From 1864 to 1962, pennies were made of 95% copper and 5% zinc-tin alloy. From 1962 to 1981, pennies were made of 95% copper and 5% zinc. Since 1983, pennies have been made of 97.5% zinc and 2.5% copper. Zinc is significantly less dense than copper. Tin is slightly more dense than zinc but still much less dense than copper.  If the suspect’s coins are genuine 1877 pennies, how should their density compare with the densities of the pennies you measured in this activity? |
| Q9. Police measured the weight of five of the suspect’s coins and found them to be 0.09 N each. Based on the data you collected, explain how the police knew that the suspect's coins were fakes.  **Hint:** What is the weight of five pennies pre-1982 and post-1982? |